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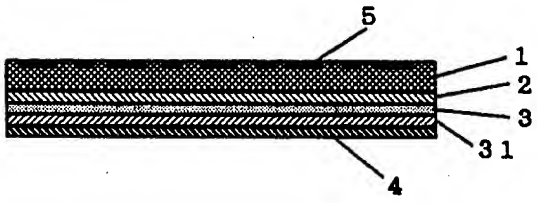
(54) [TITLE OF THE INVENTION]
PRINTING SHEETS [Insatsuyo sheeto]

(57) [ABSTRACT]
[SUBJECTS]
Development of printing sheets which show both excellent adhesive strength to adherends as well as decline property of adhesive strength by a heat treatment, and maintains a good adhered state with difficult rise [blister, hereafter translator's note] and peel even when it is adhered onto an adherend including volatile matters over long period of time.

[MEASURES OF SOLUTION]
Printing sheets comprising a printing base material (1) of either a single layer or multiple layer structure on which one plane, an adhesive layer (3) that includes thermally expanding microspheres of which outer surface is flat and smooth is arranged through an intermediate layer (2); and a side of said printing base material that at the least comes in contact with said intermediate layer comprises porous polymer layer (1) that shows at most 0.85g/cm^3 apparent density.

[EFFCTS]
It shows excellent printing characteristics, and provides delicate information in ink with good precision, and is capable of adhering to adherend group with coarse surface firmly with an easy control over adhesive strength, and said adhesive layer deforms in a three-dimensional manner with heat treatment to display excellent decline in adhesive force to allow a simple as well as secure separation from an adherend; and volatile matters in the adherend such as water and the like becomes volatile and scattered through the porous polymer layer of the base material.



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[Amendments: There are no amendments attached to this patent.]

[note: All names, addresses, company names, and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified with numeral prefix or general form of plurality suffix. Translators' note]

[CLAIMS]
[CLAIM ITEM 1]
Printing sheets which are characterized by the fact that comprises a printing base material of which structure is of either a single layer or multiple layers on which one plane, an adhesive layer with a flat and smooth outer surface and includes thermally expanding microspheres is arranged through an intermediate layer; and a side of said printing base material that at the least comes in contact with the intermediate layer comprises porous polymer layer that shows at most 0.85 g/cm^3 apparent density.

[CLAIM ITEM 2]
The printing sheets according to the claim item 1, wherein said intermediate layer comprises a layer that shows rubber elasticity, and adhesive agent of the adhesive layer comprises pressure-sensitive adhesive substance.

[CLAIM ITEM 3]
The printing sheets according to the claim item 1 or claim item 2,wherein gaps among thermally expanding microsphere within said adhesive layer mutually being at most 7 x greater than the diameter based on said microspheres having the maximum diameter, and adhesion to an adherend that includes volatile matters is conducted through said adhesive layer.

[CLAIM ITEM 4]
A label that is prepared by applying an information in ink on the printing base material of the printing sheet described in the claim items 1 ~ 3.

[DETAILED EXPLANATION OF THE INVENTION]
[0001]
[FIELDS OF INDUSTRIAL APPLICATION]
This invention relates to printing sheets showing excellent adhesive strength as well as easy peel from an adhered by a heat treatment at any optional time, and are suited for preparation of labels for adherend including volatile matters such as moisture and the like.

[0002]
[BACKGROUNDS OF THIS INVENTION]
The printing sheets which are prepared through arrangement of adhesive layer that includes thermally expanding microspheres on a printing base material comprising a film have been generally known. These are capable of reducing adhesive force through heating their adhesive layers to either foam or expand thermally expanding microspheres to enable an easy peel from the adherend; and they are used for labels of various applications such as masking or recycle purposes and the like.

[0003]
However, problem points of decline in printing properties that is caused by the affect of unevenness (凹凸) of the thermally expanding microspheres included in the adhesive layer, or poor adhesive strength that is caused by said thermally expanding microspheres being exposed on the outer surface of the adhesive layer have been pointed out. In addition, when adhesion is made on the adherend comprising modified polyphenylene oxide or polycarbonate and the like, problem of rise caused by volatile matters such as moisture in the adherend or peeling has been reported to occur.

[0004]
[SUBJECTS OF THIS INVENTION]
This invention's subject lies on a development of printing sheets showing both excellent adhesive strength against adherend as well as decline effect of adhesive strength, and shows difficult occurrence of rise or peeling even when they are adhered to adherend including volatile matters over long period of time to maintain a good adhered state.

[0005]
[MEASURES USED TO SOLVE THE SUBJECTS]
This invention offers printing sheets which are characterized by the fact that has an adhesive layer with a flat and smooth surface and includes thermally expanding microspheres that is arranged on one plane of a printing base material with a structure comprising either a single layer or multiple layers through an intermediate layer; and a side of said printing base material that at the least comes in contact with the intermediate layer comprises porous polymer layer showing at most 0.85 g/cm^3 apparent density.

[0006]
[EFFECTS OF THIS INVENTION]
It is possible to attain excellent printing characteristics against printing base material as well as to apply a fine information with ink with good precision based on above-explained structure having intermediate layer and smooth and flat outer surface of the adhesive layer; and at the same time, it prevents from exposure of thermally expanding microspheres on the outer surface to assure an effective adhesive area to display adhesive characteristics equivalent to those of adhesive agents which do not include thermally expanding microspheres to enable to easily control the adhesive strength against adherend to provide subjected adhesive strength while allowing a firm adhesion against adherend with a coarse surface, and at the same time allowing the presence of thermally expanding microsphere at nearby said adherend at high density.

[0007]
In addition, through arrangement of the adhesive layer via intermediate layer, the force that foams and/or expands thermally expanding microspheres at treatment temperature for purpose of foaming and/or expanding adhesive layer overcomes resistance force of elasticity of the intermediate layer to deform said adhesive layer in three-dimensional manner of such structure of either undulation form or wave form. As a result, reduction of adhesive area by heat treatment is accomplished with good efficiency to realize decline in adhesive strength securely to show excellent decline in adhesive force to enable to easily peel from the adherend to provide a simple and secure separation. In addition, by having a polymer layer showing at most 0.85 g/cn^3 apparent density at the side there at the least said printing base material comes in contact with the intermediately layer, volatile matters such as moisture and the like in the adherend penetrates and diffuses in the printing sheet and becomes volatile and scatters from the side plane and the like to maintain a good and stable adhesion state over long period of time without rise or peel.

[0008]
[IMPLEMENTATION FORMAT OF THIS INVENTION]
This invention's printing sheets are formed of a printing base material with such structure of either a single layer or multiple layers on which one plane, an adhesive layer with a flat and smooth outer surface and includes thermally expanding microspheres is arranged through an intermediate layer; and a side of said printing base material that at the least comes in contact with the intermediate layer comprises porous polymer layer showing at most 0.85 g/cm^3 apparent density. Figures 1 and 2 illustrate an example of this. (1) shows a printing base material; and (2) shows an intermediate layer; and (3) shows an adhesive layer; and (11), (12), and (13) show layers which form printing base material with multiple layer structure; and (31) shows an outer surface layer of the adhesive layer. Furthermore, (4) shows a separator that is arranged as needed. In addition, the Figures show a label to which printing base material, information is applied with an ink; and (5) shows that information in ink.

[0009]
As for the printing base material, either a single layer structure or multiple layer structure goods having a porous polymer layer showing at most 0.85 g/cm^3 apparent density at the side where at the least comes in contact with the intermediately layer is used. And therefore, as illustrated in the Figure 1, in the case of a single layer structure, the entire printing base material is formed of said porous polymer layer showing said apparent density; and in the case of multiple layer structure that is illustrated in the Figure 2, the side of printing base material (1) that at the least comes in contact with the intermediate layer (2) is formed of a porous polymer layer (13) showing said apparent density. Through arrangement of said porous polymer layer, it is possible for the volatile matters in the adherend to become volatile and scattered through the printing base material. The apparent density of porous polymer layer is preferably 0.10 ~ 0.83 g/cm^3, or more preferably, 0.15 ~ 0.80 g/cm^3 from the standpoint of said volatile and scattering property.

[0010]
Said porous polymer layer may be of any type as long as it shows the prescribed apparent density based on its porous structure, and therefore, no particular limitation is placed on the format of said printing base material. The preferred porous polymer layer based on said volatile and scattering property is of plastic film or porous film having micro void structure on their surfaces. The thickness of printing base material is generally at most 500 μm, or more preferably, 5 ~ 250 μm, however, it should not be limited by these.

[0011]
The printing base material of multiple layer structure may be prepared of laminate of two layers or more than three layers comprising laminate body of porous base material such as paper, cloth, or nonwoven cloth, and/or other conventional printing base material and porous polymer prepared by appropriate methods such as melt fusion method or method that uses adhesive agents. In particular, the one of which entire printing base material is formed as porous is preferable form the standpoint of volatile and scattering properties; and in addition, use of such of which porous polymer layer is formed of plastic film or porous film having micro void structure is recommended. Thickness of each layer that forms multiple layer base material may be determined accordingly; and it is generally at most 500 μm, or more preferably, 1~ 250 μm, and most preferably, 3 ~ 200 μm.

[0012]
As for the plastic that is used for said porous polymer layer or other base material, no particular limitations are placed, and appropriate materials in accordance application purpose of printing sheets may be used. For instance, followings may be generally used: olefin group resins such as polyethylene or polypropylene, ethylene.propylene copolymer or ethylene .vinyl acetate copolymer; vinyl group resins such as polystyrene or polyvinyl chloride, vinyl chloride.vinyl acetate copolymer or polyvinyl acetate, polyvinyl butylal or polyvinyl formal, polyvinyl acetal or polyvinyl hydroxide; cellulose group resins such as ethyl cellulose or cellulose acetate; or polyester group resins such as polyethylene terephthalate or polyethylene naphthalate.

[0013]
In addition, followings may be also used generally: polyurethane group resins; various polyamide group resins aliphatic group or aromatic group, xylene group resin, polycarbonate group resin, acryl group resin such as polymethyl methacrylate or polyacrylate, acetal group resin, polyallylate, polyvinylidene chloride, styrene.isoprene copolymer, rubber group polymer such as styrene. butadiene, nitrile rubber or polybutadiene; or fluorine group resins such as polyimide, polyether ether ketone, polyether sulfone, polyether imide, polysulfone, polyphenylene sulfide, polyamide imide, polyester imide, polyparabanic acid, silicone group resin, polytetrafluoro ethylene. Furthermore, it is all right to blend more than two types of plastic to use as said plastic material.

[0014]
Forming of plastic film or porous film showing micro void structure on the surface of above-explained porous polymer forming purpose may be conducted with appropriate methods such as , for instance, method to cast polymer dispersed solution such as emulsion solution and the like, a method to treat films by drawing, a method to remove fine particles which are mixed in the film through a dissolution treatment and the like, or a method to apply a piercing [perforating] treatment to the film through emboss treatment and the like, or a method to sinter polymer powder under heat through a fusion treatment, or a method to coat a solvent solution of polymer, and while that coating layer remains non-dried including said solvent, solvent for coagulation without dissolving polymer and is miscible with said solvent is sprayed on said coating layer to solidify said coating layer.

[0015]
As for the papers which may be used to for said printing base material, for instance, any appropriate papers including wood free paper or coated paper, art paper, glassine paper, Kraft paper, or impregnated paper may be used. In addition, as cloth or nonwoven cloth, the ones formed of any appropriate fibre such as, for instance, amide group or polyester group may be used.

[0016]
Various additives or chemicals and the like may be included in the printing base material. Examples include coloring agents such as white pigment for purpose of improvement of patterns applied and contrast, or antioxidants for purpose of improving durability may be mentioned. In addition, for purpose of improving fixing power of the information in ink, or close adhesion of intermediate layer, the printing base material may be subjected to such surface treatments as, for instance, chemical etching treatment such as chromium acid treatment; ionization radiation treatment such as corona treatment or plasma treatment; surface chemical or physical treatment that oxidizes surface through exposure to ozone, flame, or high voltage electric shock . In addition, a primer layer may be arranged for purpose of improving close adhesive force with intermediate layer. The printing base material that is formed of polymers showing high polarity such as polyester displays high adhesive force with said intermediate layer.

[0017]
According to this invention, the intermediate layer and adhesive layer that includes thermally expanding microspheres are the composite to attain good adhesive strength and sufficient decline in adhesive strength by a heat treatment; and such purpose may be attained through a laminate structure having an arrangement of adhesive layer (3) on the printing base material (1) through intermediate layer (2) as illustrated in the Figures.

[0018]
The intermediate layer works to offer a large adhesive area by allowing its surface to follow the surface shape of the adherend well when adhering the printing sheet to an adherend, and it also works to aid deformation of the adhesive layer in a three-dimensional manner to show an undulation structure by reducing restriction caused by foaming and/or expansion in the surface direction of printing sheet when foaming and/or expanding thermally expanding microspheres by heating the adhesive layer in order to peel this from the adherend; and furthermore, it works to control the affect of thermally expanding microspheres to improve application of fine information in ink on the printing base material.

[0019]
The intermediate layer can be formed of natural rubber or synthetic rubber showing at most 50, or more preferably, at most 40 Shore D type hardness based on D-type shore in accordance with ASTM D-2240, or synthetic resins showing rubber elasticity. Thickness may be generally set as 0.1 ~ 150 μm.

[0020]
As for said synthetic rubber or synthetic resins, for instance, synthetic rubber of nitrile group, diene group , or acryl group and the like; thermoplastic elastomers such as polyolefin group or polyester group; or synthetic resins showing rubber elasticity such as ethylene-vinyl acetate copolymer, polyurethane, polybutadiene, or soft polyvinyl chloride and the like may be mentioned. Furthermore, according to this invention, it is all right to even use the polymers of substantially a hard type such as polyvinyl chloride in combination with compounding agents such as plasticizers, or softeners to provide rubber elasticity.

[0021]
Forming of intermediate layer may be conducted with any appropriate methods such as a method to coat a solution of components comprising natural rubber, synthetic rubber, or synthetic resins showing rubber elasticity, or a method to adhere film comprising said components to the printing base material. Furthermore, the intermediate layer may be formed of pressure-sensitive adhesive substance having the main component of natural rubber, synthetic rubber, or synthetic resin showing rubber elasticity; and it may be also formed of foam film and the like having main components explained above.

[0022]
When printing sheet that is adhered to an adherend is to be peeled from that adherend at optional time, the adhesive layer works to reduce adhesion area with said adherend by providing volume change to above-explained composite through foaming and/or expansion treatment of thermally expanding microspheres by heat to allow simple peeling of the printing sheet from the adherend. Forming of said adhesive layer may be conducted by generally using thermally expanding microspheres and adhesive agent.

[0023]
As for said thermally expanding microspheres, various types which can attain above-explained purpose may be used. Examples include, for instance, the ones prepared by enclosing appropriate substance that is converted to gas and shows thermal expansion easily such as isobutane or propane or pentane within a shell forming substance through coacervation method or interfacial polymerization method and the like. The average particle diameter of thermally expanding microspheres is generally 1 ~ 50 μm.

[0024]
As for the shell forming substance that forms said thermally expanding microspheres, for instance, vinylene chloride-acrylonitrile copolymer, polyvinyl alcohol, polyvinyl butylal, polymethyl methacrylate, polyacrylonitrile, polyvinylidene chloride, or polysulfone and the like may be mentioned generally; and according to this invention, the ones which are formed of hot melt substance of substance that breaks down by thermal expansion may be used.

[0025]
As adhesive agent, polymers of rubber group or resin group which allow foaming and/or expansion of thermally expanding microspheres, or more preferably, the ones which do not restrict foaming and/or expansion of thermally expanding microspheres as best as possible may be used; and in general, appropriate adhesive agent maybe selected and used in accordance with adhesive strength and the like subjected to the printing sheet against adherend. As for the ones which are generally used, heat activation adhesive agents of low temperature activation type, water or organic solvent activation adhesive agents, or pressure-sensitive adhesive agents may be mentioned; and in particular, use of pressure-sensitive adhesive agents is recommended from the standpoint of functions aimed by adhesive layer or easy adhesion to the adherend.

[0026]
As examples of said heat activation adhesive agent of low temperature activation type, water or organic solvent activation adhesive agents, hot melt group adhesive agents, silicone group adhesive agents, fluorine group adhesive agents, UV ray curing type adhesive agents, adhesive agents showing pressure sensitive property with heat which include hot melt resin with low melt point and display a strong adhesive force with heat while showing low adhesive force at regular temperature(make reference to the Japanese Patent Applications, Kokai [laid-open] Sho 56[1981]-13040 publication and Kokoku [post-examined] Hei 2[1990]-50146 publication) may be mentioned.

[0027]
In addition, examples of pressure-sensitive adhesive agents include rubber group pressure-sensitive adhesive agents which use natural rubber or various synthetic rubber as base polymer; acryl group pressure-sensitive adhesive agents which use polymer of alkyl ester of acrylic acid or methacrylic acid, or copolymer with this and other unsaturated monomer as base polymer; the ones which use polymer showing about 10,000 ~ 3 million weight average molecular weight as base polymer and are compounded with appropriate amount of crosslinking agents such as polyisocyanate group compound or alkyl ether converted melamine compound as needed; styrene.conjugated diene block copolymer group pressure-sensitive adhesive agents; creme modified type pressure-sensitive adhesive agents (make reference to the Japanese Patent Applications Kokai Sho 56[1981]-61468 publication, Kokai Sho 61[1986]-174857 publication, Kokai Sho 63[1988]-17981 publication, and Kokoku Sho 56[1981]-13040 publication). Furthermore, said adhesive agents may include appropriate additives such as, for instance, plasticizers, fillers, anti-aging agents, or tackifiers and the like besides said crosslinking agents.

[0028]
Forming of adhesive layer may be conducted with appropriate methods such as , for instance, a method that mixes thermally expanding microspheres and adhesive agent by using solvent as needed, and coats this mixture on an intermediate layer, or a method to form said adhesive layer on a separator, and transferring this onto an intermediate layer.

[0029]
The content ratio of thermally expanding microsphere in the adhesive layer may be generally at most 10 weight %, or more preferably, 15 ~ 95 weight %, and most preferably, 20 ~80 weight % from the standpoint of initial adhesive force or decline property of adhesive force after heat treatment. Thickness and foaming magnification rate of the adhesive layer may be determined appropriately in accordance with surface shape or material and the like of adherend; and it is generally at most 500 μm, or more preferably, 1 ~ 200 μm, and most preferably, 3 ~ 70 μm. It is recommended to design the foaming magnification rate to about 1.5 ~ 100 x.

[0030]
As for the distribution ratio of thermally expanding microspheres in the adhesive layer, it is recommended to set in such manner so the distance among thermally expanding microspheres would be at most 7 x , or in particular, at most 3 x of the diameter based on the said microspheres showing the maximum diameter.

[0031]
Conversion to flat and smooth outer surface of said adhesive layer is base on the purpose of prevention from decline in adhesive force caused by reduction in effective adhesion area due to unevenness ( ) by exposure of thermally expanding microspheres to the outer surface. Thus explained flat and smoothness may be attained by appropriate methods such as a method to form an adhesive layer on a flat and smooth plane under pressure as needed, or a method to first form a printing sheet, and to press treat this with flat and smooth press rollers and the like. In addition, as illustrated in the Figures, the method to arrange an adhesive layer that does not include thermally expanding microspheres at outer surface of adhesive layer to form flat and smooth layer (31) on the outer surface may be also used.

[0032]
According to the method that arranges adhesive layers in separate manner explained above, although it is not beneficial from the standpoint of increased manufacturing process of printing sheet, it does show a beneficial point of possible control over adhesive strength against adherend while displaying such adhesive characteristics equivalent to the adhesive agent that does not include thermally expanding microspheres. In addition, there is no need to be concerned over the adhesive force against adherend regarding the portions of adhesive agent which include thermally expanding microspheres; and as it simply need to function as a binder of thermally expanding microspheres that allows foaming and/or expansion, it shows a beneficial point that it is possible to use adhesive agent (binder) that is useful for foaming and/or expansion of thermally expanding microspheres that is separate from that of said arranged adhesive layer.

[0033]
Forming of said to-be arranged adhesive layer may be conducted by appropriate methods such as, for instance, a coating method on the layer that includes thermally expanding microsphere, or transfer method of adhesive layer on a separator; and its thickness may be about 0.1 ~ 50 μm, or more preferably, 0.5 ~ 30 μm from the standpoint of adhesive force against adherend or peeling property of printing sheet by a heat treatment. Furthermore, it is preferable when the adhesive layer in the case of pressure-sensitive adhesive layer in particular is protected with a separator (4) until time of its application as illustrated in the Figures.

[0034]
It is all right to compound the compounds with high polarity or hydrophilic compounds such as water absorbing resins or emulsifiers in the intermediate layer or adhesive layer as explained above as needed for purpose of improved moisture permeability. In addition, it is possible to improve moisture permeability by forming intermediate layer or adhesive layer as a porous layer. Forming of porous type intermediate layer or adhesive layer may be conducted by appropriate methods such as , for instance, a method that expands forming material of intermediate layer or adhesive layer in a fiber form by melt blow method or curtain spray method, or a method that coats in pattern form such as dot and the like.

[0035]
This invention's printing sheet may be formed by, for instance, forming a composite body comprising an intermediate layer and adhesive layer separately, and by adhering this with a printing base material through said intermediate layer; and thus given printing sheet may firmly adhere to an adherend during adhesion and can be easily separated from the adherend through a heat treatment when it is desired to release said adhered state, and at the same time, it can maintain a good adhered state without rise or peeling against adherend that includes volatile matters such as moisture and the like.

[0036]
And therefore, this invention's printing sheets may be used for , for instance, various applications such as bar code labels for recycle products or masking labels which desire or require a release of its adhered state after attaining the purpose of adhesion on the appropriate adherend which include polymers such as modified polyphenylene oxide or polycarbonate group resin, or the ones which include volatile matters such as moisture and the like such as formed fibre or wood material for prescribed period of time.

[0037]
Labels may be prepared by applying necessary information or patterns such as information in ink (5) on the printing base material (1) of the printing sheet as illustrated in the Figures. And therefore, labels may be formed by ordinary methods; and the ink that is used or pattern forming method such as printing method may be of optional forms; and information application in pattern forms is also optional.

[0038]
Heat treatment conditions which allow easy peeling of printing sheet or label from the adherend may be determined based on the surface state of adherend, reduction in adhesion area by types of thermally expanding microspheres, heat resistance f printing base material or adherend; and generally conditions include 100 ~ 250°C for 1 ~90 seconds. That heating treatment may be conducted in step-like manner appropriately in accordance with application purpose.

[0039]
[EXAMPLES]
EXAMPLE 1
A compound to which copolymer comprising 50 parts (refers to parts by weight hereafter) butyl acrylate, 50 parts of ethyl acrylate. 2 parts of crosslinking agent is added was coated on one plane of a Yupo [transliteration] paper (refers to FPG-80 made by Oji Yuka Goseishi K.K. hereafter) showing 0.77 g/cm^3 apparent density that is formed of a polymer material; and this was dried to arrange a rubber-form organic elastic layer (intermediate layer) with 15 μm, and on this, a mixture solution that includes thermally expanding microspheres was coated and was dried at low temperature to arrange an adhesive layer with flat and smooth outer surface showing 40 μm thickness to give a printing sheet.

[0040]
The mixture solution explained above was prepared by compounding 60 parts of thermally expanding microspheres showing 15 μm average particle diameter and 1.01 specific gravity and 2 parts of polyisocyanate group crosslinking agent with a copolymer comprising 80 parts of butyl acrylate, 15 parts of ethyl acrylate, and 5 parts of acrylic acid.

[0041]
EXAMPLE 2
A compound prepared by adding 2 parts of crosslinking agent to a copolymer comprising 94 parts of butyl acrylate, 3 parts of vinyl acetate, and 3 parts of acrylic acid was coated on a Yupo paper laminated with polypropylene film showing 30 μm thickness , and this was dried to arrange an intermediate layer with 30 μm ; and on this, an adhesive layer with 50 μm was arranged in the same manner as explained in the example1 to give a printing sheet.

[0042]
EXAMPLE 3
A printing sheet was prepared in the same manner as explained in the example 2 by arranging an intermediate layer on a nonwoven cloth (Erutasu NO 1020 [transliteration] made by Asahi Kasei Kogyo K.K.) showing 0.21 g/cm^3 apparent density and is formed of polymer material that is a laminate with polypropylene film with 30 μm thickness.

[0043]
COMPARATIVE EXAMPLE 1
A printing sheet was prepared in the same manner as explained in the example 1 by using polyester film (nonporous type) showing 50 μm thickness as a printing base material.

[0044]
COMPARATIVE EXAMPLE 2
A printing sheet was prepared in the same manner as explained in the example 2 by using polypropylene film with 30 μm thickness laminated with polyester film with 50 μm thickness as a printing base material.

[0045]
EVALUATION TESTS

Printing sheets given by examples and comparative examples were studied for the characteristics explained below.

ADHESION MAINTAINING PROPERTY

The printing sheet was adhered to a modified polyphenylene oxide panel via its adhesive layer, and this was heated for 24 hours at 50°C to study the presence of rise.

[0046]
ADHESIVE FORCE

The printing sheet with 20 mm width was adhered to a modified polyphenylene oxide panel, and this was measured for 180o peel adhesive force (peel speed 30 m/minute, 23°C) to study adhesive force prior to heating (initial period) and after heat treating at 170°C for 45 seconds.

[0047]

Results of above-explained evaluation are shown in the Table below. Furthermore, apparent density of printing side of the printing base material and intermediate layer contact side (inner side) are also shown in the Table.

	Examples			Comparative examples	
	1	2	3	1	2
apparent density of base material (g/cm^3):					
printing side	0.77	0.89	0.89	1.4	0.89
inner side	-	0.77	0.21	-	1.4
maintenance of adhesion (presence of rise)	none	none	none	present	present
adhesive force (g/20mm) before heating	620	1050	950	800	1000
after heating	20	15	35	5	5

[BRIEF DESCRIPTION OF THE FIGURES]
[FIGURE 1]
Cross section of an example of a label

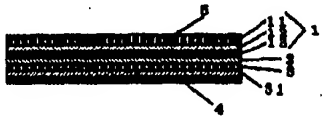
[FIGURE 2]
Cross section of an other example of a label

[DESCRIPTION OF CODES]
1: printing base material (11, 12, 13: base material forming layer)
2: intermediate layer
3: adhesive layer (31: outer surface layer)
5: information in ink

Figures 1 and 2

【図1】

【図2】



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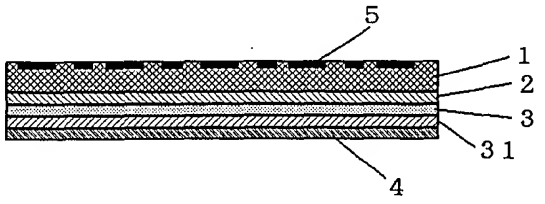
(54)【発明の名称】　印刷用シート

(57)【要約】

【課題】　被着体に対する接着強度と加熱処理による接着強度の低下効果の両方に優れ、揮発分含有の被着体に長期に接着しても浮きや剥がれを生じにくくて良好な接着状態を維持する印刷用シートの開発。

【解決手段】　単層又は多層構造の印刷用基材（1）の片面に中間層（2）を介し、熱膨張性微小球を含有して外表面（31）が平滑な接着剤層（3）を有してなり、前記印刷用基材の少なくとも中間層と接する側が見掛け密度0．85g／cm^3以下の多孔性高分子層（1）からなる印刷用シート。

【効果】　印刷特性に優れて微細なインク情報も精度よく付与でき、接着強度の制御が容易で粗面系被着体にも強固に接着でき、加熱処理で接着剤層が三次元的に変形して接着力の低下性に優れ、被着体よりの分離操作を簡単かつ確実に行えて、被着体中の水分等の揮発分が基材の多孔性高分子層を介して揮散する。



【特許請求の範囲】

【請求項１】　単層又は多層構造の印刷用基材の片面に中間層を介し、熱膨張性微小球を含有して外表面が平滑な接着剤層を有してなり、前記印刷用基材の少なくとも中間層と接する側が見掛け密度０．８５ｇ／cm^3以下の多孔性高分子層からなることを特徴とする印刷用シート。

【請求項２】　請求項１において、中間層がゴム弾性を有する層からなり、接着剤層の接着剤が感圧性接着物質からなる印刷用シート。

【請求項３】　請求項１又は２において、接着剤層における熱膨張性微小球の相互の間隔が最大直径を有する該微小球に基づきその直径の７倍以下であり、その接着剤層を介して揮発分含有の被着体に接着するためのものである印刷用シート。

【請求項４】　請求項１～３に記載の印刷用シートにおける印刷用基材に、インク情報を付与してなるラベル。

【発明の詳細な説明】

【０００１】

【発明の技術分野】本発明は、接着強度に優れると共に、任意な時に加熱処理により被着体より簡単に剥離できて、水分等の揮発分含有の被着体用のラベル形成などに好適な印刷用シートに関する。

【０００２】

【発明の背景】従来、熱膨張性微小球含有の接着剤層をフィルムからなる印刷用基材に設けてなる印刷用シートが知られていた。これは、その接着剤層を加熱して熱膨張性微小球を発泡ないし膨張させることで接着力を低下でき、被着体より容易に剥離できるようにしたものであり、マスキング用やリサイクル用等の種々の用途のラベル形成に用いられている。

【０００３】しかしながら、接着剤層が含有する熱膨張性微小球の凹凸が印刷用基材に影響して印刷性を低下させ、また熱膨張性微小球が接着剤層の外表面に露出して被着体に対する接着強度に乏しい問題点があった。さらに変性ポリフェニレンオキシドやポリカーボネート等からなる被着体に接着した場合、被着体中の水分等の揮発分で浮きや剥がれの生じる問題点もあった。

【０００４】

【発明の解決課題】本発明は、被着体に対する接着強度と加熱処理による接着強度の低下効果の両方に優れ、揮発分含有の被着体に長期に接着しても浮きや剥がれを生じにくくて良好な接着状態を維持する印刷用シートの開発を課題とする。

【０００５】

【課題の解決手段】本発明は、単層又は多層構造の印刷用基材の片面に中間層を介し、熱膨張性微小球を含有して外表面が平滑な接着剤層を有してなり、前記印刷用基材の少なくとも中間層と接する側が見掛け密度０．８５ｇ／cm^3以下の多孔性高分子層からなることを特徴とする印刷用シートを提供するものである。

【０００６】

【発明の効果】中間層を介在させ、接着剤層の外表面を平滑とした上記構成により、印刷用基材に対する印刷特性に優れて微細なインク情報も精度よく付与できると共に、熱膨張性微小球が外表面に露出することを防止して有効接着面積を確保でき、熱膨張性微小球を含有しない接着剤に匹敵する接着特性を発揮させることも可能となって被着体に対する接着強度を容易に制御でき、目的とする接着強度を得ることができて粗面からなる被着体に対しても強固に接着でき、かつ被着体の近傍に熱膨張性微小球を高密度に存在させることも可能となる。

【０００７】また中間層を介して接着剤層を配置することにより、接着剤層を発泡及び／又は膨張させるための処理温度において熱膨張性微小球の発泡及び／又は膨張する力が中間層の弾性率による抗力に勝って接着剤層がうねり構造ないし波形構造に三次元的に変形する。その結果、加熱処理による接着面積の減少が効率的に達成されて接着強度の低下が確実に実現され、接着力の低下性に優れて被着体より容易に剥離できて分離操作を簡単に、かつ確実に行うことができる。さらに印刷用基材がその少なくとも中間層と接する側に見掛け密度０．８５ｇ／cm^3以下の高分子層を有することで、被着体中の水分等の揮発分が印刷用シート中に浸透拡散し側面等より揮散して、良好な接着状態を浮きや剥がれなく長期に安定して持続する。

【０００８】

【発明の実施形態】本発明の印刷用シートは、単層又は多層構造の印刷用基材の片面に中間層を介し、熱膨張性微小球を含有して外表面が平滑な接着剤層を有してなり、前記印刷用基材の少なくとも中間層と接する側が見掛け密度０．８５ｇ／cm^3以下の多孔性高分子層からなるものである。その例を図１、図２に示した。１が印刷用基材、２が中間層、３が接着剤層であり、１１，１２，１３が多層構造の印刷用基材を形成する層で、３１が接着剤層の外表面層である。なお４は、必要に応じて設けられるセパレータである。また図は、印刷用基材にインク情報を付与してなるラベルを示しており、５がそのインク情報である。

【０００９】印刷用基材としては、少なくとも中間層と接する側に見掛け密度が０．８５ｇ／cm^3以下の多孔性高分子層を有する単層構造物又は多層構造物が用いられる。従って図１に例示の如き単層構造物では、印刷用基材の全体が前記見掛け密度の多孔性高分子層にて形成され、図２に例示の如き多層構造物では、印刷用基材１の少なくとも中間層２と接する側が前記見掛け密度の多孔性高分子層１３にて形成される。かかる多孔性高分子層を配置することで被着体中の揮発分を印刷用基材を介して揮散させることが可能となる。その揮散性等の点より好ましい多孔性高分子層の見掛け密度は、０．１０～

０．８３ｇ／cm^3、就中０．１５～０．８０ｇ／cm^3である。

【００１０】前記の多孔性高分子層は、その多孔構造に基づいて所定の見掛け密度を示すものであればよく、従って印刷用基材の形態については特に限定はない。揮散性等の点より好ましい多孔性高分子層は、表面にミクロボイド構造を有するプラスチックフィルムや多孔質フィルムなどである。印刷用基材の厚さは、５００μｍ以下、就中５～２５０μｍが一般的であるがこれに限定されない。

【００１１】なお多層構造の印刷用基材は、紙や布や不織布の如き多孔質基材、又は／及びその他の従来の印刷用基材と多孔性高分子層との熱融着方式や接着剤による方式等の適宜な方式によるラミネート体等からなる２層又は３層以上の積層体などとして得ることができる。就中、揮散性等の点より印刷用基材の全体が多孔性に形成されたものが好ましく、また多孔性高分子層を前記したミクロボイド構造を有するプラスチックフィルムや多孔質フィルムで形成されたものが好ましい。多層基材を形成する各層の厚さは、適宜に決定しうるが一般には５００μｍ以下、就中１～２５０μｍ以下、特に３～２００μｍとされる。

【００１２】前記の多孔性高分子層やその他の基材形成材を形成するプラスチックとしては特に限定はなく、印刷用シートの使用目的などに応じて適宜なものを用いうる。一般には例えばポリエチレンやポリプロピレン、エチレン・プロピレン共重合体やエチレン・酢酸ビニル共重合体の如きオレフィン系樹脂、ポリスチレンやポリ塩化ビニル、塩化ビニル・酢酸ビニル共重合体やポリ酢酸ビニル、ポリビニルブチラールやポリビニルホルマール、ポリビニルアセタールやポリ水酸化ビニルの如きビニル系樹脂、エチルセルロースや酢酸セルロースの如きセルロース系樹脂、ポリエチレンテレフタレートやポリエチレンナフタレートの如きポリエステル系樹脂が用いられる。

【００１３】また、ポリウレタン系樹脂、脂肪族系や芳香族系等の各種のポリアミド系樹脂、キシレン系樹脂、ポリカーボネート系樹脂、ポリメチルメタクリレートやポリアクリレートの如きアクリル系樹脂、アセタール系樹脂、ポリアリレート、ポリ塩化ビニリデン、スチレン・イソプレン共重合体やスチレン・ブタジエンゴム、ニトリルゴムやポリブタジエンの如きゴム系ポリマー、ポリイミド、ポリエーテルエーテルケトン、ポリエーテルスルホン、ポリエーテルイミド、ポリスルホン、ポリフェニレンサルファイド、ポリアミドイミド、ポリエステルイミド、ポリパラバン酸、シリコーン系樹脂、ポリテトラフルオロエチレンの如きフッ素系樹脂なども一般に用いられる。なおプラスチックは２種以上のプラスチックをブレンドして用いることもできる。

【００１４】上記した多孔性高分子層形成用の、表面にミクロボイド構造を有するプラスチックフィルムや多孔質フィルムの形成は、例えば乳化液等のポリマー分散液をキャスティングする方式やフィルムを延伸処理する方式、除去用微粒子混入のフィルムよりその混入微粒子を溶出処理等により除去する方式やフィルムにエンボス加工等の穿孔処理を施す方式、ポリマーの粉末を加熱下に融着処理する焼結方式や、ポリマーの溶剤による溶液を塗工しその塗工層が溶剤を含有して未乾燥の状態にある内に、塗工層に当該溶剤とは相溶性でポリマーは溶解しない凝固用溶剤を噴霧して当該塗工層を固化させる方式などの適宜な方式で行うことができる。

【００１５】なお印刷用基材の形成に用いられることのある紙としては、例えば上質紙やコート紙、アート紙やグラシン紙、クラフト紙や含浸紙などの適宜なものを用いうる。また布や不織布としても、例えばアミド系やポリエステル系などの適宜な繊維からなるものを用いうる。

【００１６】印刷用基材には、種々の添加剤ないし薬剤等を含有させることができる。その例としては、付与するパターンとのコントラストの向上等を目的とした白色顔料等の着色剤、耐久性の向上等を目的とした酸化防止剤などがあげられる。また印刷基材には、インク情報の定着力や中間層の密着力の向上等を目的に例えばクロム酸処理の如きケミカルエッチング処理、コロナ処理やプラズマ処理の如きイオン化放射線処理、オゾン暴露や火炎暴露や高圧電撃暴露等により表面を酸化させる化学的又は物理的処理などの表面処理を施すこともできる。さらに中間層との密着力の向上等の目的からはプライマー層なども設けることができる。なおポリエステルの如き極性の高いポリマー等からなる印刷用基材は、中間層と強い接着力を発揮する。

【００１７】本発明において中間層と熱膨張性微小球含有の接着剤層は、良好な接着強度と加熱処理による接着強度の充分な低下を達成するための複合体であり、図例の如く印刷用基材１に中間層２を介して接着剤層３を配置した積層構造とすることによりかかる目的を達成することができる。

【００１８】中間層は、印刷用シートを被着体に接着する際にその表面が被着体の表面形状に良好に追従して大きい接着面積を提供する働き、及び被着体より剥離するために接着剤層を加熱して熱膨張性微小球を発泡及び／又は膨張させる際に印刷用シートの面方向における発泡及び／又は膨張の拘束を少なくして接着剤層がうねり構造に三次元的に変形することを助長する働き、並びに熱膨張性微小球の影響を抑制して印刷用基材に対する微細なインク情報の付与性を向上させる働きをするものである。

【００１９】中間層は、ＡＳＴＭ　Ｄ-２２４０のＤ型ショアー-によるショアー-Ｄ型硬度に基づいて５０以下、好ましくは４０以下の天然ゴムや合成ゴム、又はゴム弾

性を有する合成樹脂により形成することができる。厚さは、０．１～１５０μmが一般的である。

【００２０】前記の合成ゴム又は合成樹脂としては、例えばニトリル系、ジエン系、アクリル系などの合成ゴム、ポリオレフィン系やポリエステル系の如き熱可塑性エラストマー、エチレン-酢酸ビニル共重合体、ポリウレタン、ポリブタジエン、軟質ポリ塩化ビニルなどのゴム弾性を有する合成樹脂があげられる。なお、ポリ塩化ビニルの如く本質的には硬質系のポリマーであっても可塑剤や柔軟剤等の配合剤との組合せでゴム弾性をもたせたものも本発明においては用いうる。

【００２１】中間層の形成は、天然ゴム、合成ゴム又はゴム弾性を有する合成樹脂からなる成分の溶液を塗布する方式や、前記成分からなるフィルム等を印刷用基材と接着する方式などの適宜な方式で行ってよい。なお本発明において中間層は、天然ゴムや合成ゴム又はゴム弾性を有する合成樹脂を主成分とする感圧性接着物質で形成されていてもよく、またかかる成分を主体とする発泡フィルム等で形成されていてもよい。

【００２２】接着剤層は、被着体に接着した印刷用シートを任意な時にその被着体より剥離する際に、加熱による熱膨張性微小球の発泡及び／又は膨張処理を介し上記した複合体に体積変化を与えて被着体との接着面積を減少させ、印刷用シートを被着体より簡単に剥離できるようにするものである。接着剤層の形成は、一般に熱膨張性微小球と接着剤を用いて行うことができる。

【００２３】熱膨張性微小球としては、上記の目的を達成できる種々のものを用いることができる。その例としては、例えばイソブタンやプロパンやペンタンの如く容易にガス化して熱膨張性を示す適宜な物質をコアセルベーション法や界面重合法等で殻形成物質内に内包させたものなどがあげられる。用いる熱膨張性微小球の平均粒径は、１～５０μmが一般的である。

【００２４】なお熱膨張性微小球を形成する殻形成物質としては、例えば塩化ビニリデン-アクリロニトリル共重合体やポリビニルアルコール、ポリビニルブチラールやポリメチルメタクリレート、ポリアクリロニトリルやポリ塩化ビニリデン、ポリスルホンなどが一般的であるが、本発明においては熱溶融性物質や熱膨張で破壊する物質などからなっていてればよい。

【００２５】接着剤としては、熱膨張性微小球の発泡及び／又は膨張を許容するゴム系や樹脂系等のポリマー類、好ましくは熱膨張性微小球の発泡及び／又は膨張を可及的に拘束しないものが用いられ、通例、印刷用シートの被着体に対する目的接着強度等に応じて適宜な接着剤を選択使用することができる。一般に用いられるものとしては、低温活性化タイプの熱賦活性接着剤や、水又は有機溶剤賦活性接着剤、あるいは感圧性接着剤などがあげられ、就中、本発明において接着剤層が担う機能や被着体への接着簡便性などの点より感圧性接着剤が好ましく用いられる。

【００２６】前記の低温活性化タイプの熱賦活性接着剤や水又は有機溶剤賦活性接着剤の例としては、ホットメルト系接着剤、シリコーン系接着剤、フッ素系接着剤、紫外線硬化型接着剤、低融点の熱溶融性樹脂を含有して常温では低接着力で加熱により強い接着力を発現する熱時感圧接着剤（特開昭５６-１３０４０号公報、特公平２-５０１４６号公報）などをあげることができる。

【００２７】また感圧性接着剤の例としては、天然ゴムや各種の合成ゴムをベースポリマーとするゴム系感圧性接着剤、アクリル酸やメタクリル酸のアルキルエステルのポリマーやそれと他の不飽和単量体とのコポリマーをベースポリマーとするアクリル系感圧性接着剤、重量平均分子量が約１万～３００万のポリマーをベースポリマーとし、これに必要に応じてポリイソシアネート系化合物やアルキルエーテル化メラミン系化合物の如き架橋剤を適量配合したもの、その他、スチレン・共役ジエンブロック共重合体系感圧性接着剤、シリコーン系感圧性接着剤、紫外線硬化型感圧性接着剤、クリープ改良型感圧性接着剤などがあげられる（特開昭５６-６１４６８号公報、特開昭６１-１７４８５７号公報、特開昭６３-１７９８１号公報、特公昭５６-１３０４０号公報）。なお接着剤は、前記の架橋剤のほか、例えば可塑剤、充填剤、老化防止剤、粘着性付与剤などの適宜な添加剤を含有していてもよい。

【００２８】接着剤層の形成は、例えば熱膨張性微小球と接着剤を必要に応じ溶媒を用いて混合し、その混合物を中間層の上に塗布する方式や、セパレータ上に当該接着剤層を形成してそれを中間層上に移設する方式などの適宜な方式で行うことができる。

【００２９】接着剤層における熱膨張性微小球の含有割合は、初期接着力や加熱処理後の接着力低下性などの点より１０重量%以上、就中１５～９５重量%が一般的であり、好ましくは２０～８０重量%である。接着剤層の厚さや発泡倍率は、被着体の表面形状や材質等により適宜に決定され、一般には５００μm以下、就中１～２００μm、特に３～７０μmの厚さとされる。発泡倍率は、１．５～１００倍程度となるように設計することが好ましい。

【００３０】接着剤層における熱膨張性微小球の分布割合は、印刷用シートの加熱による被着体よりの確実な剥離を達成する点などより、熱膨張性微小球の相互の間隔が最大直径を有する該微小球に基づきその直径の７倍以下、特に３倍以下の距離で密集するようにすることが好ましい。

【００３１】接着剤層の外表面における平滑化は、熱膨張性微小球の外表面での露出による凹凸で有効接着面積が減少し、接着力が低下することの防止を目的とする。かかる平滑化は、平滑面上で必要に応じ押圧下に接着剤層を形成する方式や、印刷用シート形成後、平滑な加圧

ローラ等を介してプレス処理する方式などの適宜な方式で行うことができる。また図例の如く、接着剤層の外表面に熱膨張性微小球を含有しない接着剤層を付設して外表面の平滑層３１を形成する方式なども採ることができる。

【００３２】前記した別個の接着剤層付設方式は、印刷用シートの製造工程が増える不利はあるものの、熱膨張性微小球を含有しない接着剤に匹敵する接着特性を発揮させて被着体に対する接着強度を容易に制御できる利点がある。また熱膨張性微小球を含有する部分における接着剤について、被着体に対する接着力を考慮する必要がなくなり、発泡及び／又は膨張を許容する熱膨張性微小球の単なる結合剤として機能すればよいことから当該付設接着剤層とは別種の、熱膨張性微小球の発泡及び／又は膨張に有利な接着剤（結合剤）を用いうる利点などもある。

【００３３】当該付設接着剤層の形成は、熱膨張性微小球含有層上への塗布方式やセパレータ上の接着剤層の移設方式などの適宜な方式で行うことができ、その厚さは、被着体への接着力や加熱処理による印刷用シートの剥離性などの点より約０．１～５０μm、就中０．５～３０μmが好ましい。なお接着剤層は、特に感圧型接着剤層の場合には、図例の如く実用に供するまでの間、セパレータ４を接着するなどして保護することが好ましい。

【００３４】上記において中間層や接着剤層には、透湿性の向上等を目的に必要に応じて吸水性樹脂や乳化剤の如き高極性化合物や親水性化合物、吸水性化合物などを配合することもできる。また中間層や接着剤層を多孔層として形成することにても透湿性の向上をはりうる。多孔型の中間層や接着剤層の形成は、例えばメルトブロー方式やカーテンスプレー方式等で中間層や接着剤層の形成材を繊維状に展開する方式、点状等にパターン塗工する方式などの適宜な方式で行うことができる。

【００３５】本発明の印刷用シートは、例えば中間層と接着剤層からなる複合体を別個に形成してそれと印刷用基材とを、その中間層側を介して接着する方式などによっても形成することができるものであるが、得られた印刷用シートは、接着時には被着体に強固に接着でき、接着状態を解きたいときには加熱処理で被着体より容易に剥離ないし分離できると共に、水分等の揮発分を含有する被着体に対して浮きや剥がれなく良好な接着状態を長期に持続しうるものである。

【００３６】従って本発明の印刷用シートは、変性ポリフェニレンオキシドやポリカーボネート系樹脂の如きポリマー、あるいは繊維成形物や木材などの水分等の揮発分を含有する適宜な被着体に所定期間接着したのち接着目的達成後、その接着状態を解くことが要求される、あるいは望まれる例えばリサイクル製品用のバーコードラベルやマスキング用ラベルなどの種々の用途に好ましく用いることができる。

【００３７】ラベルは、図例の如く印刷用シートにおける印刷用基材１にインク情報５等の必要な情報や模様などを付与することにより得ることができる。従ってラベルは、従来に準じた方法にて形成することができ、用いるインクや印刷方式等のパターン形成方式などは任意であり、またパターン等の付与情報も任意である。

【００３８】なお印刷用シート又はラベルを被着体より容易に剥離できるようにするための加熱処理条件は、被着体の表面状態や熱膨張性微小球の種類等による接着面積の減少性、印刷用基材や被着体の耐熱性等の条件により決められるが、一般的な条件は１００～２５０℃、１～９０秒間である。その加熱処理は、使用目的に応じて適宜な段階で行うことができる。

【００３９】

【実施例】

実施例１

アクリル酸ブチル５０部（重量部、以下同じ）、アクリル酸エチル５０部及びアクリル酸５部からなる共重合体に架橋剤２部を添加した配合物を、高分子材料からなる見掛け密度が０．７７ｇ／cm^3のユポ紙（王子油化合成紙社製、ＦＰＧ-８０、以下同じ）の片面に塗布し乾燥させて厚さ１５μmのゴム状有機弾性層（中間層）を設け、その上に熱膨張性微小球を含有する混合液を塗布し低温で乾燥させて外表面が平滑な厚さ４０μmの接着剤層を付設して印刷用シートを得た。

【００４０】前記の混合液は、アクリル酸ブチル８０部、アクリル酸エチル１５部及びアクリル酸５部からなる重量平均分子量２５万の共重合体に、平均粒径１５μm、比重１．０１の熱膨張性微小球６０部とポリイソシアネート系架橋剤２部を配合したものである。

【００４１】実施例２

アクリル酸ブチル９４部、酢酸ビニル３部及びアクリル酸３部からなる共重合体に架橋剤２部を添加した配合物を、厚さ３０μmのポリプロピレンフィルムとラミネートしたユポ紙上に塗布し乾燥させて厚さ３０μmの中間層を設け、その上に実施例１に準じて厚さ５０μmの接着剤層を設けて印刷用シートを得た。

【００４２】実施例３

厚さ３０μmのポリプロピレンフィルムとラミネートした高分子材料からなる見掛け密度が０．２１ｇ／cm^3の不織布（旭化成工業社製、エルタスＮ０１０２０）の上に中間層を設けたほかは実施例２に準じて印刷用シートを得た。

【００４３】比較例１

印刷用基材に、厚さ５０μmのポリエステルフィルム（無多孔質）を用いたほかは実施例１に準じて印刷用シートを得た。

【００４４】比較例２

印刷用基材に、厚さ５０μmのポリエステルフィルム

（無多孔質）に厚さ３０μmのポリプロピレンフィルムとラミネートしたものを用いたほかは実施例２に準じて印刷用シートを得た。

【００４５】評価試験

実施例、比較例で得た印刷用シートについて下記の特性を調べた。

接着維持性

印刷用シートをその接着剤層を介して変性ポリフェニレンオキシド板に接着し、５０℃で２４時間加熱して浮きの発生の有無を調べた。

【００４６】接着力

幅２０mmの印刷用シートを変性ポリフェニレンオキシド板に接着し、その１８０度ピール接着力（剥離速度３００mm／分、２３℃）を測定する方式で、加熱前（初期）接着力及び１７０℃で４５秒間加熱処理したのちの接着力を調べた。

【００４７】前記の結果を次表に示した。なお表には印刷用基材の印刷側及び中間層接触側（内部側）の見掛け密度も示した。

		実施例			比較例	
		1	2	3	1	2
基材の見掛け密度（g／cm³）	印刷側	0.77	0.89	0.89	1.4	0.89
	内部側	－	0.77	0.21	－	1.4
接着維持性（浮きの有無）		無	無	無	有	有
接着力（g／20mm）	加熱前	620	1050	950	800	1000
	加熱後	20	15	35	5	5

【図面の簡単な説明】

【図１】ラベル例の断面図

【図２】他のラベル例の断面図

【符号説明】

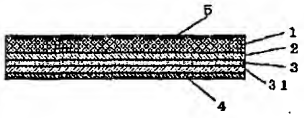
１：印刷用基材（１１，１２，１３：基材形成層）

２：中間層

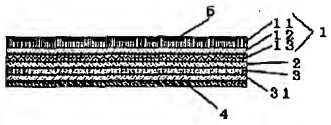
３：接着剤層（３１：外表面層）

５：インク情報

【図１】



【図２】



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